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ABSTRACT

This packet contains a program guide and Career Merit Achievement Plan (Career MAP) for the implementation of a computer-integrated manufacturing program in Florida secondary and postsecondary schools. The program guide describes the program content and structure, provides a program description, lists job titles under the program, and includes a curriculum framework and student performance standards for computer integrated manufacturing courses. The curriculum framework outlines major concepts and content, laboratory activities, program specifics, and intended outcomes; the student performance standards guide lists each standard and the behaviors expected to show mastery of each standard. The guide also provides information on the following: (1) program implementation; (2) instructional resources (a listing of 27 print materials, 6 audiovisuals, and 3 software programs, along with publishers' addresses); (3) facility design for computer engineering technology laboratories and classrooms, equipment, safety, maintenance, and liability; and (4) teacher professional development, teacher certification, professional organizations and support services. The Career MAP is a checklist, to be kept by student and teacher, of student progress in the competencies required for entry into jobs in the computer integrated manufacturing field. (KC)

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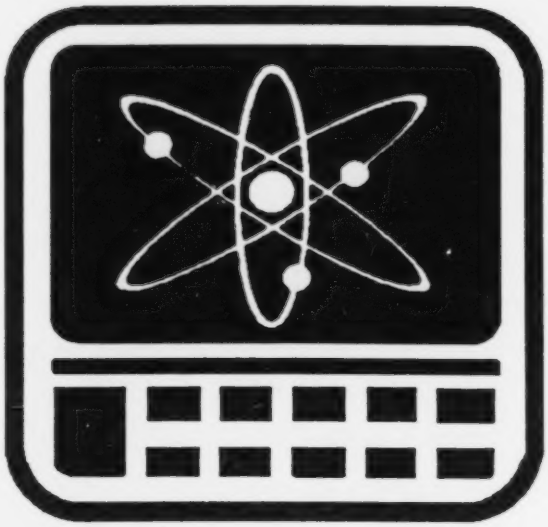

FLORIDA VOCATIONAL PROGRAM GUIDE FOR

COMPUTER INTEGRATED MANUFACTURING

Prepared by

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INTRODUCTION

Vocational education meets the needs of students desiring to pursue a selected vocation and is designed to provide training that is realistic in meeting present and future employment opportunities. In recent years, applications of science and technology have expanded rapidly, increasing the education and training required of workers. This has made vocational training programs more attractive as an educational option. The new technologies require well-trained workers to carry out both standardized and specialized procedures, and whose training foundations have given them the capacity to keep pace with continuing technology demands.

The Florida Department of Education shares with business and industry the determination to provide opportunities for upward mobility to as many Floridians as possible. Vocational training programs can keep pace with the demands of new industrial patterns and can provide the opportunity for many of our citizens to gain financial stability and an improved sense of self worth. Therefore, it is necessary to create exemplary vocational programs and to make those programs consistent throughout the state.

This Program Guide identifies primary concerns that should be considered in the organization, operation and evaluation of a vocational education program. It has been developed to provide useful information to local school district and community college administrators, instructors, program advisory committees, regional coordinating councils and others charged with the responsibility of offering vocational education programs.

OCCUPATIONAL DESCRIPTION

A principle occupational title is identified for each vocational training program. This title is validated by the United States Department of Labor Dictionary of Occupational Titles (DOT) or other appropriate references. Such references may be the United States Department of Commerce Standard Occupational Classification Manual (SOC), the Occupational Employment Statistics Survey Dictionary (OES), or Vocational Preparation and Occupations (VPO) prepared by the National and State Occupational Information Coordinating Committees. Information obtained from industry advisory committees may also be used to validate the principle occupational title. The job title and code number for this program are listed in the curriculum framework which accompanies this guide.

The United States Department of Labor Dictionary of Occupational Titles (D.O.T.) identifies the job title for this occupational area as follows:

D.O.T. JOB TITLE	D.O.T. CODE
Automated Equipment Engineer-Technician	638.261-010

The definition (description) for this job title is taken from the D.O.T. for easy reference.

AUTOMATED EQUIPMENT ENGINEER-TECHNICIAN (mach. mfg.) engineer, automated equipment; technician, automated equipment.

Installs machinery and equipment used to emboss, die-cut, score, fold, and transfer paper or cardboard stock to form box blanks, knockdown advertising displays, and similar products: Confers with customer's engineering staff to determine layout of equipment, to resolve problems of machine design, and to avoid construction problems in plant. Arranges machine parts according to sequence of assembly and effective use of floor space. Directs workers in positioning equipment, following floor plans and manufacturer's instructions. Assembles and installs electrical and electromechanical components and systems, using handtools, electrical testing instruments, soldering irons, and wiring diagrams. Operates equipment through trial run to verify setup. Adjusts controls and setup of machine for specified type, thickness, and size of stock to be processed, for prescribed sequence of operating stages, and to insure maximum efficiency. Instructs equipment operators and engineering and maintenance personnel regarding setup,

operation, and maintenance of equipment. Repairs and services equipment, following preventive maintenance schedule or upon customer's request. May modify previously installed equipment to insure compatibility with new units, or install safety devices or attachments to old equipment. May confer with customer's engineers to determine effective methods of programing work for machine processing.

PROGRAM CONTENT

The Division of Vocational, Adult, and Community Education, as required by State Board of Education (**S.B.E.**) **Rule 6A-6.0571**, publishes Vocational Education Program Courses Standards annually. This document specifies the minimum program content for the operation of a vocational training program for the occupational titles listed. Each program identified in the Florida Department of Education Course Code Directory is required to establish course standards. The standards for each vocational offering are comprised of two major components: (1) Curriculum Framework and (2) Student Performance Standards.

Curriculum Framework (CF)

The Curriculum Framework specifies the exact course title, course number, levels of instruction, major course content, laboratory activities, special notes, major course concepts and intended outcomes. The program requirements stipulated in the curriculum framework have been approved by the State Board of Education and are the legal bases for delivery of instruction.

Student Performance Standards (SPS)

The Student Performance Standards are a resource list of job-specific competencies. This list is generated and approved by industry experts and becomes the basis for curriculum development in vocational programs. Local school districts and community colleges must, by law, adopt student performance standards for their vocational programs. They may, at their discretion, adopt the list provided or develop their own as long as there is sufficient content to address each intended outcome. A program may provide instruction beyond the minimum specified in the SPS if desired. The decision to do this should be based on local industry needs. However, the minimum must be presented.

The SPS for secondary level programs contain a third component, course structure. This component specifies the number of courses required for program completion and the content of each course. The courses may be taught in any sequence, but the content may not be changed unless approved by the Division of Vocational, Adult, and Community Education.

The curriculum framework and student performance standards are intended for use as a guide, not a teaching tool. Teachers or curriculum development personnel are expected to develop or select complete curriculum materials for their training programs based on the curriculum framework and student performance standards. Each intended outcome and SPS should be thoroughly analyzed for related cognitive and procedural subskills. The curriculum framework and student performance standards are presented in the following pages.

CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1991

PROGRAM TITLE: Computer Integrated Manufacturing

CODE NUMBER: Secondary _____ Postsecondary _____

Florida CIP 0615.049901

SECONDARY SCHOOL CREDITS ____ COLLEGE CREDITS ____ POSTSECONDARY ADULT VOCATIONAL CREDITS ____

APPLICABLE LEVELS(S): __ 7-9 __ 9-12 __ Postsecondary Adult Vocational

_X_ Postsecondary Vocational ____ Other _____

CERTIFICATION COVERAGE:

I. MAJOR CONCEPTS/CONTENT: This program is designed to prepare students for employment as automation equipment technicians (638.261-010) or in related occupations in electronics.

Electronic Technology and/or Electronic Engineering Technology (CORE) are prerequisites for entry into this electronic specialization program. The CORE program prepares individuals to assemble, install, operate, maintain, troubleshoot and repair electronic equipment used in industry. In addition, it also includes content related to the design, theory, and analysis of electronic systems and applications.

This specialization content includes, but is not limited to, calibration of production line equipment, integration of controllers with workcells, bar code tracking systems, vision systems, retrieval systems, production planning operating and maintaining production equipment and test instruments, CIM systems analysis, data communications, CAD systems and quality assurance.

II. LABORATORY ACTIVITIES: Electronic laboratory activities are an integral part of this program. The tools, test equipment, materials and processes used in this laboratory are similar to those used in industry. Students should be able to use the test equipment found in the laboratory in the electronics industry for the purpose of analyzing, troubleshooting and repairing electronics circuitry and automated equipment.

III. SPECIAL NOTE: As part of an Associate in Science Degree, there is a major component of general education requirements which allows the student to more easily relate the technical knowledge gained to a theoretical level and to allow for greater knowledge expansion and transference in the future.

This general education requirement must have a minimum of 15 semester hours with at least one course in oral and written communication and one course in computational skills. The computational skills should include algebra and trigonometry.

The cooperative method of instruction may be utilized for this program. When the cooperative method is offered, the following is required for each student: a training plan signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; and a work station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal. The student must receive compensation for work performed.

To be transferable statewide between institutions, this program/course must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not preclude institutions from developing specific program or course articulation agreements with each other.

The typical length of this program for the average achieving student is an Associate in Science Degree.

IV. INTENDED OUTCOMES: After successfully completing this program, the student will be able to:

01. Demonstrate proficiency in machines and mechanisms.
02. Demonstrate proficiency in manufacturing processes.
03. Demonstrate proficiency in operating and maintaining manufacturing equipment for automated assembly.
04. Demonstrate proficiency in evaluating the efficiency and performance of individual production line equipment.
05. Demonstrate proficiency in integrating production equipment with workcells, programmable logic controllers and area controllers.
06. Demonstrate proficiency in bar coding, automatic tracking vision systems and automatic storage and retrieval systems for materials handling.
07. Demonstrate proficiency in manufacturing software applications used for production planning, quality control and shop floor data collection.
08. Demonstrate proficiency in programming and controlling production machines in a flexible automation environment.
09. Demonstrate proficiency in operating and maintaining production test equipment and instruments.
10. Demonstrate proficiency in CIM systems analysis.
11. Demonstrate proficiency in installing and maintaining and understanding network and data communications devices.
12. Demonstrate proficiency in basic use of computer assisted drafting and design equipment used in a manufacturing environment.
13. Demonstrate proficiency in use of quality assurance methods and statistical process control techniques.

STUDENT PERFORMANCE STANDARDS EFFECTIVE DATE: July, 1991

PROGRAM AREA: Industrial SECONDARY NUMBER:

PROGRAM TITLE: Computer Integrated Manufacturing Technology POSTSECONDARY NUMBER:

01.0 DEMONSTRATE PROFICIENCY IN MACHINES AND MECHANISMS--
The student will be able to:

01.01 Identify, define and analyze various electromechanical systems, including pneumatic, hydraulic and electrical.
01.02 Construct flow diagrams of electromechanical system.
01.03 Analyze and identify mechanical linkages (gears, pulleys, limit switches, etc.).
01.04 Analyze and identify electromechanical devices (motors, servos, relays, stepping switches, timing devices, etc.).
01.05 Analyze and identify sensing elements.
01.06 Analyze and identify optical canning and encoding/decoding devices.
01.07 Analyze and identify error sensing/feedback and control mechanisms.

02.0 DEMONSTRATE PROFICIENCY IN MANUFACTURING PROCESSES--
The student will be able to:

02.01 Understand current manufacturing processes.
02.02 Understand the use of current manufacturing machines, operating systems and mechanisms.
02.03 Understand hydraulic, electrical and pneumatic devices used in production assembly and materials handling.
02.04 Understand OSHA, state, and local safety requirements for the manufacturing and assembly operations with automated equipment.
02.05 Understand manpower needs and skills needed in assembly operations.
02.06 Understand integration requirements for charging conventional manufacturing to CIM.
02.07 Understand the criteria for tool design, maintenance, procurement and handling.
02.08 Understand gage design, usage and limitations.
02.09 Understand the requirements and solutions for raw materials orientation and clamping.
02.10 Analyze and recommend the usage of jigs and fixtures, including effectors and special grippers for robotics.
02.11 Understand the concepts and considerations required for products manufactured from sheet metal.
02.12 Understand the special equipment required for sheet metal fabrication and forming.
02.13 Understand concepts of injection molding equipment.
02.14 Understand the concepts involved in the process of designing and fabricating specialized tools for numerical controlled machine application.
02.15 Understand the concepts and special considerations involved with operating computer numerical control equipment.
02.16 Understand the functions of the industrial computer and microprocessor controls in modern manufacturing.

03.0 DEMONSTRATE PROFICIENCY IN OPERATING AND MAINTAINING MANUFACTURING EQUIPMENT FOR AUTOMATED ASSEMBLY--The student will be able to:

- 03.01 Interpret blueprints, schematics and technical manuals.
- 03.02 Establish routine operations involving maintenance schedules.
- 03.03 Analyze system failures.
- 03.04 Perform minor repairs to CIM systems.
- 03.05 Coordinate and specify maintenance service.
- 03.06 Evaluate need for equipment replacement, overhaul and retooling.

04.0 DEMONSTRATE PROFICIENCY IN EVALUATING THE EFFICIENCY AND PERFORMANCE OF INDIVIDUAL PRODUCTION LINE EQUIPMENT--The student will be able to:

- 04.01 Design the routing, storage and procurement/distribution systems for raw and finished products.
- 04.02 Analyze and utilize statistical data from process control systems.
- 04.03 Describe the relationship of equipment utilization to the manufacturing economy.
- 04.04 Prepare and evaluate justifications for specification deviations.

05.0 DEMONSTRATE PROFICIENCY IN INTEGRATING PRODUCTION EQUIPMENT WITH WORKCELLS, PROGRAMMABLE LOGIC CONTROLLERS AND AREA CONTROLLERS--The student will be able to:

- 05.01 Design analog and digital control systems along with applicable software to specific manufacturing requirements.
- 05.02 Chart and analyze ladder logic diagrams for manufacturing processes.
- 05.03 Develop and analyze flow charts from ladder diagrams and related process controls.
- 05.04 Operate Programmable Logic Controllers with device drivers.
- 05.05 Apply software to workcells and area controllers.
- 05.06 Integrate control systems and equipment with production and production support mechanisms.

06.0 DEMONSTRATE PROFICIENCY IN BAR CODING, AUTOMATIC TRACKING VISION SYSTEMS AND AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS FOR MATERIALS HANDLING--The student will be able to:

- 06.01 Describe automatic inventory accounting and control system.
- 06.02 List the underlying principles and method of controlling work in progress.
- 06.03 Analyze product flow cycle.
- 06.04 Describe warehouse throughput systems.
- 06.05 Implement automated tracking in the laboratory environment.
- 06.06 Describe machine vision applications.
- 06.07 Maintain machine vision and sensing system equipment.

07.0 DEMONSTRATE PROFICIENCY IN MANUFACTURING SOFTWARE APPLICATIONS USED FOR PRODUCTION PLANNING, QUALITY CONTROL AND SHOP FLOOR DATA COLLECTION--The student will be able to:

07.01 Apply proficiency in manufacturing software application packages.
07.02 Analyze data collection systems for maintaining the progress of each order.
07.03 Assign and maintain priorities of individual orders.

08.0 DEMONSTRATE PROFICIENCY IN PROGRAMMING AND CONTROLLING PRODUCTION MACHINES IN A FLEXIBLE AUTOMATION ENVIRONMENT--The student will be able to:

08.01 Define and analyze product manufacturing requirements and process.
08.02 Identify the responsibilities of management in produced production.
08.03 Integrate personnel, hardware and software for the timely completion of product manufacturing.
08.04 Describe the relationship of quality assurance and manufacturing.
08.05 Apply the basic principles underlying the relationship between systems design, production and manufacturing engineering.
08.06 Apply manufacturing simulation packages used in layout and design of production operations.
08.07 Apply manufacturing resources planning and just-in-time concepts in production planning operations.
08.08 Apply engineering economy factors in equipment justification.
08.09 Apply microprocessor controls to a modern manufacturing system.

09.0 DEMONSTRATE PROFICIENCY IN OPERATING AND MAINTAINING PRODUCTION TEST EQUIPMENT AND INSTRUMENTS--The student will be able to:

09.01 Specify, interconnect and operate instruments and test equipment.
09.02 Analyze normal and abnormal instrument readings and their probable causes.
09.03 Specify and operate Automatic Test Equipment (ATE) procedures, using required software and hardware.
09.04 Troubleshoot control systems mechanisms and software.
09.05 Repair faults in production equipment and specify external repairs or overhaul requirements.
09.06 Align, calibrate and maintain related ATE interfaces and circuits.
09.07 Prepare error probability charts and graphs.

10.0 DEMONSTRATE PROFICIENCY IN CIM SYSTEMS ANALYSIS--The student will be able to:

10.01 Describe the concepts of a generic CIM system.
10.02 Analyze and identify problems with the operation of industrial

computers, controllers and hardware.

10.03 Utilize typical screens and files available to shop floor operations for troubleshooting and data collection.

10.04 Operate industrial terminals, input/output communications interface devices, etc., found in the manufacturing environment.

11.0 DEMONSTRATE PROFICIENCY IN INSTALLING AND MAINTAINING AND UNDERSTANDING NETWORK AND DATA COMMUNICATIONS DEVICES--The student will be able to:

11.01 Identify and apply communications protocols.
11.02 Identify and apply networks and classifications.
11.03 Identify and apply throughput, memory size/capabilities and standards benchmark.
11.04 Identify and apply computer options for sharing directories, files and servers.
11.05 Select and apply sensors and feedback devices.
11.06 Select and interconnect cabling, repeaters, modems and multiplexers.

12.0 DEMONSTRATE PROFICIENCY IN BASIC USE OF COMPUTER ASSISTED DRAFTING AND DESIGN EQUIPMENT USED IN A MANUFACTURING ENVIRONMENT--The student will be able to:

12.01 Operate CAD systems and hardware.
12.02 Apply CAD support software to manipulate interval files, attributes, database exchange files, and set-up.
12.03 Apply CAD software to create, edit, and update drawings and files.
12.04 Identify and define protocols and software used to download CAD to CAM.
12.05 Describe the relationship and functions of CAD in the industrial production environment.

13.0 DEMONSTRATE PROFICIENCY IN USE OF QUALITY ASSURANCE METHODS AND STATISTICAL PROCESS CONTROL TECHNIQUES--The student will be able to:

13.01 Describe the concept of quality assurance in increasing productivity and promoting zero defects.
13.02 Apply data collection methods for productivity improvement and reporting.
13.03 Analyze productivity data, identify problem areas and evaluate the cause and effect relationship.
13.04 Develop and apply quality improvement strategies.
13.05 Develop and apply QA methods and techniques for production and product handling in a CIM environment.
13.06 Understand process capability and its applications.
13.07 Use statistical quality control (SQC) tools and techniques to analyze data.

PROGRAM IMPLEMENTATION

It is the teacher's responsibility to ensure that students learn how to competently perform the tasks specified in the course objectives. Therefore, the teacher must lead the students through the learning experiences in a course, motivate students, act as a role model for students, and at times, function as a guidance counselor and placement coordinator. This leadership role requires the teacher to participate in many of the activities required for program implementation. The teacher must select the methods of instruction that best apply to students' ability levels, measure student achievement and provide feedback. Key factors that must be considered when implementing this program are addressed below.

TEACHER CHARACTERISTICS

Subject Knowledge

The teacher must be a subject matter expert who is able to implement sound instructional methods and evaluate student performance. He/she must have significant work experience in the industry/vocational field and be able to communicate that knowledge to the students.

Instructional Delivery

The teacher's role in the learning process is to motivate and lead the student as well as impart subject matter knowledge. In order to maximize student learning, the use of a variety of instructional methods is encouraged. Because teaching styles vary greatly, teachers are highly encouraged to "pick and choose" from various methods or to combine methods for maximum benefit to students. Some of the more traditional methods used are lecture, demonstration and small group instruction. Other teaching methods which are suggested for further exploration include individualized self-paced, open-exit/open-entry, contract, computer based and competency based instruction. The focus of Competency Based Vocational Education (CBVE) is to ensure that each student can competently perform tasks specified before progressing to more complex skills.

CONVENTIONAL INSTRUCTIONAL METHODS

A vocational program may require a portion of the instruction to be presented in a standard lecture or controlled demonstration format. These methods of instruction can be easily combined with instructor controlled step-by-step practical exercises. Some instructional activities may dictate that this instructional approach be used to introduce students to hazardous equipment often utilized in vocational training. In most situations, students should be required to perform specified activities to achieve maximum skill competency. If mastery of a task is required, competency based education methods may be more appropriate. However, if the training activity involves an orientation or a seldom performed, non-essential task, conventional instructional methods may be more effective. Teachers are encouraged to use a variety of instructional methods to best meet instructional objectives.

Instructional Development

Teachers often must develop and select their own teaching and curriculum materials. In developing a comprehensive curriculum, instructional objectives based upon both the performance and cognitive domain must be included. When developing curriculum materials, teachers must use the curriculum framework (CF) and student performance standards (SPS) contained in this program guide as a basis. These materials delineate minimim program content which must be presented for an approved vocational training program. However, they are not intended for use as a comprehensive curriculum. Be certain not to adapt the curriculum to available materials, but select only those materials which can be adapted to the curriculum.

Instructional Measurement

Teachers must select testing methods that support the instructional delivery system used. Teachers must be competent to develop, administer and evaluate written and performance type tests.

Student Admissions Criteria

Providing the student the opportunity to successfully complete a vocational education program, in any institution, should be the primary concern of the instructional effort. Therefore, it is very important to direct planning and effort into identifying and selecting students with excellent potential for success in the educational program and in the occupation. The school's primary task is to prepare people for fulltime, entry-level positions as technicians or, in the case of those with more experience, as managers.

The Course Code Directory, specifies grade levels at which occupational programs are offered. Specific student admissions criteria which are required by the State and local educational agencies for the Computer Integrated Manufacturing training program are illustrated as follows.

SPECIFIC ADMISSIONS CRITERIA

Minimum Age:	As required by state and local policy
Physical Requirements:	None
Special Requirements:	None
Minimum Basic Skills Math Level:	* 10.0
Minimum Basic Skills Language Level:	* 9.0

* This grade level requirement is specified in the Curriculum Framework and is applicable to postsecondary level programs of 450 hours or more only. There is no minimum basic skill requirement for secondary programs.

THE STUDENT PROFILE

Developing a student profile is an important step in program implementation. Attention should focus on student characteristics that can be remediated within a training program, but could create serious impediments to success in the vocational field. Typical of these would be deficiencies in communication and mathematical skills. The basic skill levels can be measured by testing. Test results can then be used to direct the student to more suitable training which matches his or her skill level, or to determine supplemental training which may be required to increase chances for student success.

High school and postsecondary vocational students can be admitted to a vocational program upon request if they meet any specified prerequisites, such as physical or basic skill requirements. Training programs should be accessible to as many students as possible. Training programs are designed to prepare students for employment upon graduation, or serve as prerequisite to a postsecondary program.

The community college can be more selective and establish stringent admission standards. This may be done by assessing applicants or by recruiting potential students who meet the established prerequisite requirements of the training. The program advisory committee can design a profile of the potentially successful student. The profile should contain a

list of qualities, traits and aptitudes that will indicate a higher potential for student success. Acceptable levels for these traits must also be determined. For example, the qualities deserving highest attention, mechanical ability and cognitive aptitude, are those which the educational program itself will not likely be able to influence, although these traits should have considerable weight in establishing the basic profile. Deficiencies in mathematical or communication skills may lend themselves to improvement through related instruction while the student is enrolled in the program. The following example illustrates specific qualities to consider when establishing the student profile:

Mechanic/Technician--Service

- Knowledge of basic tools and equipment used by mechanics/technicians
- Ability to analyze and solve mechanical and technical problems
- Ability to interpret written mechanical/technical materials
- Ability to interpret mechanical/technical drawings
- Mechanical dexterity

Mechanic/Technical Service Management

- Basic application of service
- Business skills
- Ability to work with people
- Communication skills
- Leadership

QUALIFYING AND PRETESTING

Assessing potential students for vocational programs is an integral part of the recruiting process since considerable amounts of time and money will be spent on students entering training. Recruiters must have a good idea of the candidate's basic aptitude. - Whoever guides the candidate to the program needs to have knowledge of the student's interests, abilities and experience. These can be measured by a variety of assessment methods, which should be performed upon program entry. The assessment can help determine extent and level of training each individual should receive.

The minimim basic skills requirement for mathematics and language skills is specified on the curriculum framework. Assessment should determine the level at which the student can read, write, calculate mathematics and understand the English language. It is appropriate for the program advisory committee and the school to develop some selection criteria based on minimum skill levels. These criteria should remain flexible in order to maximize educational opportunity for all applicants. Additionally, vocational educators must make every effort to serve the variety of "special needs" students and to eliminate sex-bias and stereotyping in all occupational areas.

ADVISORY COMMITTEE

It is imperative that representatives of industry be organized into an advisory committee. Constantly changing technological demands of our society will continue to stimulate changing industrial patterns. Therefore, effective use of program advisory committees is vital to the successful implementation of vocational training programs. Advisory committees provide expert technical advice which is not easily obtainable elsewhere, offer external support of policies and have tremendous public relations potential.

The most effective advisory committees are those whose members have mutual respect for each other's abilities and vested interest in the training program because of their need for trained workers. The program advisory committee is also one of the most effective means of facilitating placement. Its role can be:

- To contact local industry and encourage them to use the school's placement office as a means of filling jobs
- To develop an effective procedure for interviewing and evaluating potential employees suggested by the school
- To assist in gathering accurate and current job information as it becomes available

COUNSELING AND GUIDANCE

Counseling of students serves two purposes. It guides the student into the program and it supports enrolled students on a continuing basis throughout the program. Much day-to-day counseling will be the responsibility of the teacher. The teacher has the most contact with the student and is in a position to detect and correct a problem. Each student will encounter new problems as the program develops. The teacher's job is to work with the student to help identify problems and then strive for solutions. The teacher will provide much of the counseling that focuses on trade knowledge and skills.

The professional counselor cannot be expected to have the subject matter expertise of the primary teacher. The counselor, however, can focus on the student's needs related to other issues such as personal growth, interests and attitudes. The ideal situation will provide at least one counselor with current knowledge of industry standards for career counseling. A useful tool which should be used in the counseling process is the Career Merit Achievement Plan (Career MAP) which presents minimum instructional content keyed to student performance standards. Career MAPs are available for each industrial program area, and can be used to document student achievement, isolate student interests, talents and weaknesses. They are also useful for placement purposes. Information on Career MAPs may be obtained by contacting the Department of Education, Division of Vocational, Adult, and Community Education, (904) 488-0484.

STUDENT PLACEMENT

Implementing an effective placement system is integral to developing a successful vocational training program. **S.B.E. Rule 229.551 (3)(g)** requires 70 percent placement of students who have completed a vocational training program. Although placement is not always a problem, as with students already working in a related occupation, the placement program should place emphasis upon students who are seeking entry-level employment since these students have little or no experience with industry.

The task of the placement program is to locate job openings in the community. The placement coordinator or teacher must know each student's personal aims and interests in addition to the information stated on the achievement record. In many cases, teachers are the best source to match students to job openings because of their contacts with the industry advisory committee. Input concerning employment openings must come from individual business establishments in the community. The placement coordinator should introduce a student to as many suitable job openings as possible. Conversely, employers can then be expected to interview as many qualified candidates as possible.

Cooperative Education

COOPERATIVE EDUCATION APPLICABILITY

Normally, a student will complete the entire program as a full-time student before obtaining employment as an automated equipment technician. However, there may be situations where a student could be allowed to complete part of the program while employed as an automated equipment technician. At this time it is appropriate for the student to enroll in industrial cooperative education (ICE). Guidelines for this training plan are provided in the "Industrial Cooperative Education Program Guide," published by the Division of Vocational, Adult, and Community Education, Order # IE 508 BK 87.

Industrial cooperative education is a method of instruction designed to prepare students for jobs in the community. This method is a joint effort between the school and the business community. Student trainees receive a combination of instruction in the classroom and related on-the-job training through employment. Learning experiences are jointly planned and supervised by the teacher and the employer. Cooperative education is relevant to the needs of the student preparing for a work role, and will help the student to achieve success and personal satisfaction as the transition is made from school to the constantly changing world of work.

Cooperative education is defined in the Federal Register, Volume 39, number 143, Vocational Education, Section 102.96, as a program ". . . to prepare students for employment, through: (a) providing meaningful work experiences combined with formal education enabling students to acquire knowledge, skills, and appropriate attitudes, (b) removing the artificial barriers which separate work and education, (c) involving educators with employers, creating interaction whereby the needs and problems of both are made known, thereby making it possible for occupational curricula to be revised to reflect current needs in various occupations . . . ."

PURPOSE

Cooperative Education is for persons who, through written cooperative arrangements between the school and employers, receive instruction, including required academic courses and related instruction by alternation of study in school with a job in any industrial occupational field. These two experiences must be planned and supervised by the school and employers so that each contributes to the student's education and employability. Work periods and school attendance may be on alternative half days, full days, weeks or other periods of time to fulfill objectives of the cooperative education program.

GOALS AND OBJECTIVES

The primary goal of the cooperative method of vocational education is to prepare skilled, responsible individuals who can assume a productive role in the community. Specific objectives to meet the primary goal are:

- To prepare individuals for employment, adjustment and advancement in specified occupations or occupational areas (primary objective)
- To provide an understanding of the contribution of work to the social and economic welfare of our nation
- To provide students with an understanding and appreciation of the American free enterprise system
- To foster an awareness of the civic, social and moral responsibilities of individuals to society

- To stimulate students' interest in their chosen occupational fields and provide an understanding of the opportunities in each field
- To provide training that results in increased efficiency in performing job tasks
- To provide curriculum which is sensitive and adaptable to changes in occupational practices and procedures as they are affected by societal, economic, technical and educational developments
- To strive to develop a greater appreciation of the value of specifically trained personnel among employers, employees and consumers
- To reinforce skills learned in the school laboratory
- To provide experiences on tools and equipment not available in the school laboratory
- To supplement and broaden the school curriculum into areas not otherwise available

Student Organization Participation

Vocational student organizations operate pursuant to federal and state laws, which authorize them as viable components of vocational education programs. According to federal regulations, the vocational education program of instruction may include activities of vocational student organizations which are an integral part of the vocational instruction offered and which are supervised by vocational education personnel. The **S.B.E.** Rules authorize vocational student organizations as an integral part of the vocational education program as stated in **S.B.E. 6A-6.064 (7)** and **6A-6.065 (8).**

VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)

VICA is an organization for secondary or postsecondary students enrolled in trade and industrial education programs in high schools, area vocational technical centers and junior and community colleges. It is the only national and international organization for trade and industrial students. The organization is designed to expand and enrich opportunities for leadership, social awareness and civic responsibility in vocational students.

Students who participate in VICA activities are often better prepared for the world of work. They acquire knowledge of the many opportunities available in their chosen careers and become aware of the value of their

contributions to society. They are also given opportunities to develop and utilize their talents and abilities in ways that otherwise would not be available to them.

BENEFITS OF VICA MEMBERSHIP FOR THE STUDENT

Membership in VICA offers the student the opportunity for growth and development in the following areas:

School and Community Service Activities Students in VICA become involved in various school and/or community services. These may include clothing or food collections for the needy, donation of time and service to the elderly and participation in fund raisers or similar activities.

Social Interaction with Fellow Students Activities are also available that offer students time for relaxation and fun. Social activities of this type may be held on a regular basis. They might be held on the school campus during school hours, or off campus after school. More formal functions would include end of the year award banquets or industry/employer appreciation dinner banquets.

Competition in Skill and Leadership Contests VICA offers various contests in all the skill and leadership areas it serves. Often, teachers identify talented students who represent their school in regional competitions. However, any student member of VICA may compete. Instructors should conduct planned contests within their trade areas. This also pertains to leadership areas. First and second place regional winners then move on to the state level contest. The state winners then compete at the national level of the United States Skill Olympics.

INSTRUCTIONAL RESOURCES

STUDENT REFERENCE MATERIALS

Necessary instructional texts or pertinent material should be available for each student to satisfy training objectives. When textbooks are used, the copyright date should be as current as possible.

SERVICE MANUALS

Manuals with current manufacturer's service procedures and specifications should be available. These manuals must be located where students can use them while working in the shop area.

PERIODICALS

Current general and technical magazines and newspapers should be available for student and instructor use.

The following list of suggested resources is organized under each outcome shown in the curriculum framework. These resources have been recommended by instructors and program administrators.

01.0 DEMONSTRATE PROFICIENCY IN EVALUATING THE EFFICIENCY AND PERFORMANCE OF INDIVIDUAL PRODUCTION LINE EQUIPMENT

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Sensors, The Journal of Machine Perception ISSN 0746-9462	NORTH AMERICAN TECHNOLOGY, INC.	magazine
Basic Technical Physics Tippens SBN 0-07-064971-5	McGRAW-HILL BOOK COMPANY	text
Industrial Circuits and Automated Manufacturing Clyde O. Kale 0-03-028682-4	HOLT, RINEHART & WINSTON, Division of CBS College Publishing	text
Industrial Motor Control Fundamentals McIntyre-Losee ISBN 0-07-045110-9	McGRAW-HILL BOOK COMPANY	text
Microcomputer Operation, Troubleshooting & Repair Robert T. Paynter 0-13-580341-1	PRENTICE-HALL, Division of Simon & Schuster	text
Process Control Instrumentation Technology Curtis D. Johnson 0-471-85340-2	JOHN WILEY & SONS, INC.	text
Production Magazine		magazine
Robotics, An Introduction Malcolm	PWS KENT PUBLISHING	text
Understanding & Using Controllers Thomas E. Kissek	PRENTICE-HALL, Division of Simon & Schuster	text

02.0 DEMONSTRATE PROFICIENCY IN INTEGRATING PRODUCTION EQUIPMENT WITH WORKCELLS, PROGRAMMABLE LOGIC CONTROLLERS AND AREA CONTROLLERS.

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
An Introduction to Project Planning Jack Gido 0-8311-1160-7	INDUSTRIAL PRESS, INC.	text
Machine Shop Estimating Nordhoff 47159	McGRAW-HILL BOOK COMPANY	text
Process Planning Curtis 0-471-83254-5	JOHN WILEY & SONS, INC.	text
Production Processes, the Productivity Handbook Bolz 0-8311-1088-0	INDUSTRIAL PRESS, INC.	text

03.0 DEMONSTRATE PROFICIENCY IN BAR CODING, AUTOMATIC TRACKING VISION SYSTEMS AND AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS FOR MATERIALS HANDLING.

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Robotics Technology Spiteri 0-03-020858-0	SAUNDERS COLLEGE PUBLISHING	text

04.0 DEMONSTRATE PROFICIENCY IN MANUFACTURING SOFTWARE APPLICATIONS USED FOR PRODUCTION PLANNING, QUALITY CONTROL AND SHOP FLOOR DATA COLLECTION.

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
EE Production News	EE PRODUCTION NEWS	magazine
LAN Times ISSN 1040-5917	LAN TIMES	magazine
Modern Application News		magazine
Oracle News	ORACLE NEWS	magazine
Tool Design for Manufacturing Mark A. Curtis 0-471-88106-6	JOHN WILEY & SONS, INC.	text

05.0 DEMONSTRATE PROFICIENCY IN PROGRAMMING AND CONTROLLING PRODUCTION MACHINES IN A FLEXIBLE AUTOMATION ENVIRONMENT.

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Automation	PENTON PUBLICATION	magazine
Build Your Own Universal Computer Interface Bruce Chubb 0-8306-3122-4	TAB BOOKS	text
CIM A Different Perspective	IBM CORPORATION	video
Solutions, IBM & the Bigger Picture	IBM CORPORATION	video
The Second Industrial Revolution	IBM CORPORATION	video

06.0 DEMONSTRATE PROFICIENCY IN OPERATING AND MAINTAINING PRODUCTION TEST EQUIPMENT AND INSTRUMENTS.

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Industrial Circuits Kale 0-03-028682-4	HOLT, RINEHART & WINSTON, Division of CBS College Publishing	text
Quality Technicians Handbook Gary Griffith 0-471-82258-2	JOHN WILEY & SONS, INC.	text
Adept #307 Vision of Quality	ADEPT TECHNOLOGY, INC.	video
Adept Guide to Flexible Automation	ADEPT TECHNOLOGY, INC.	video
CIM	ALLEN BRADLEY CORP.	video

07.0 DEMONSTRATE PROFICIENCY IN CIM SYSTEMS ANALYSIS.

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
LOTUS		software
Quattro Pro Spreadsheet		software
Smart II Ver 2.0		software
Laboratory Automation Using the IBM PC Gates & Becker ISBN 013521295-2	PRENTICE-HALL, Division of Simon & Schuster	text

08.0 DEMONSTRATE PROFICIENCY IN INSTALLING AND MAINTAINING AND UNDERSTANDING NETWORK AND DATA COMMUNICATIONS DEVICES.

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Network World	NETWORK WORLD	magazine
Computer Numerical Cont. Warrens-Seames 0-8273-3782-5	DELMAR PUBLISHING	text
Computer Numerical Cont. Joseph Pusztai & Michael Sava 0-8359-0924-7	RESTON PUBLISHING COMPANY, INC., A Prentice-Hall Company	text

PUBLISHERS' ADDRESSES

ADEPT TECHNOLOGY, INC.
150 Rose Orchard Way
San Jose, CA 95134

ALLEN BRADLEY CORP.
3100 Medlock Bridge Rd.
Norcross, GA 30071

DELMAR PUBLISHING
2 Computer Drive West
Albany, NY 12212

EE PRODUCTION NEWS
P.O. Box 12973
Overland Park, KS 66212

HOLT, RINEHART & WINSTON,
Division of CBS College
Publishing
383 Madison Avenue
New York, NY 10017

IBM CORPORATION

INDUSTRIAL PRESS, INC.
200 Madison Avenue
New York, NY 10016

JOHN WILEY & SONS, INC.
605 Third Avenue
New York, NY 10158

LAN TIMES
P.O. Box 652
Hightstown, NJ 08520

McGRAW-HILL BOOK COMPANY
1221 Avenue of the Americas
New York, NY 10020

MODERN APPLICATIONS NEWS
2504 North Tamiami Trail
Nokomis, FL 34275-9987

NETWORK WORLD
161 Worcester Rd.
Framingham, MA 01701

NORTH AMERICAN TECHNOLOGY,
INC.
Strand Building, 174 Concord
St.
Peterborough, NH 03458

ORACLE NEWS
12416 Hymeadow Drive
Austin, TX 78750

PRENTICE-HALL, Division of
Simon & Schuster
Route 9 West
Englewood Cliffs, NJ 07632

PENTON PUBLICATIONS
1100 Superior Avenue
Cleveland, OH 44197-8003

PRODUCTION MAGAZINE
6600 Clough Pike
Cincinnati, OH 45244-9972

PWS-KENT PUBLISHING
Division of Wadsworth, Inc.
Belmont, CA 94002

RESTON PUBLISHING COMPANY,
INC., A Prentice-Hall Company
200 Old Tappan Road
Old Tappan, NJ 07675

TAB BOOKS
13311 Monterey Lane
Blue Summit, PA 17294

FACILITIES

Facility Design Recommendations

Facilities, tools and equipment are essential parts of training programs, and must be designed to meet State program standard requirements and instructional objectives. This section of the Program Guide contains information for setting up classroom and laboratory facilities. Facility design criteria and space requirements are specified in **S.B.E. Section B, Chapter 6A-2.**

TEACHING FACILITIES

The instructional environment should duplicate, as closely as possible, the real-life work environment the student will enter after graduation. The more the school resembles the industrial environment, the easier it will be for the student to make the transition from school to work. Tools, supplies and equipment should conform to local industry standards. The teacher should actively pursue supplemental resources to expose the students to state-of-the-art equipment.

All facilities should include classroom space, as well as space for regular classroom equipment such as audio-visual equipment. Laboratory facilities should be equipped with work stations or workbenches, tables, chairs and special training aids to demonstrate basic principles and theory. They should contain enough tools and equipment to enable several students to work individually on the same learning activity.

UPDATING FACILITIES

To keep pace with technological changes and improvements, facilities must be updated on a continuing basis. When planning facilities, priority must be to provide space which will fulfill changing needs of the instructional program. Buildings should be designed with flexibility to expand in order to accommodate future program changes and to allow for greater ease of facility updating. The program advisory committee should be used to assist the school in establishing priorities for obtaining facilities, tools and equipment. Careful planning and analysis of current and future needs will lead to the establishment of an effective training environment.

SCHOOL FACILITIES

Computer Integrated Manufacturing

This section of the program guide provides guidelines for Computer Integrated Manufacturing program facilities. All vocational programs must meet additional facility requirements specified in **S.B.E. Section B, Chapter 6 A-2.**

The classroom/laboratory areas should be designed to accommodate oversized machinery, equipment, materials and holding tables. Each area should be equipped with special lighting, as necessary. The area should provide oversized openings equipped with service entry doors to the movement and transporting of oversized equipment, materials and products.

The laboratory should include electrical outlets providing 110 volts at each work station. Electrical outlets should be permanently mounted to the work station benches. Additional electrical outlets should be installed along the walls and in the center areas of the laboratory. Electrical outlets in the center areas should be mounted on posts between the ceiling and work stations or on pull down extension systems. Special electrical wiring may be required to supply the power requirements of specialized equipment. All electrical service must be installed according to local building code requirements.

CLASSROOM/LABORATORY FACILITIES

Space requirements for **new** facility construction for this program are specified in **S.B.E. Rule 6A-2.032** as shown below.

NEW FACILITIES
COMPUTER INTEGRATED MANUFACTURING

Occupant Design Stations	20
Net Square Feet Per Occupant	
Minimum	70
Normal	80
Maximum	90
Total Net Square Feet	
Minimum	1400
Normal	1600
Maximum	1800

WORK STATION ARRANGEMENT

The arrangement of work stations and specialized equipment depends upon the general layout of the facilities, but careful consideration must be given to convenience to entrances and exits, easy movement among work stations and tool/storage areas. The area should have a counter convenient to work stations. Overall layout of the facility should be planned so that the location of entrances and exits permits a logical flow of work in progress. One of the most critical factors in planning a facility is the arrangement of work stations to obtain a safe, efficient traffic pattern.

ADDITIONAL FACILITY CONSIDERATIONS

Training Stations

Training stations and live work areas must be available in the type and number required to meet program goals and performance objectives.

Instructional Area

A classroom or designated area of the laboratory should be available for lecture, instruction, viewing audio visual materials and other nonshop activities.

Personal Tool/Equipment Storage Area

A secure storage room or area should be provided, with enough shelf space for student supplies/tool boxes and floor space for equipment.

General Storage

Storage areas for tools, parts, supplies and machines must be sufficient to support the activities outlined in the program goals and performance objectives.

Office Space

An area separate from the classroom and laboratory should be available and convenient for use by the instructor(s) as an office.

Maintenance

A regular facilities maintenance program must be implemented to ensure that equipment and facilities are safe and usable to meet instructional needs.

Housekeeping

The classroom, laboratory and support area(s) must be kept clean and orderly.

Ventilation

A fume/dust removal system should be in place and operable. When appropriate, heating and cooling systems should be used to provide sufficient comfort for learning. Ventilation requirements are stated in **S.B.E. Rule 6A-2.066.**

First Aid

A first aid station must be in place, well marked and complete with appropriate supplies.

Support Facilities

Restrooms, clean-up areas and lockers convenient to the shop should be available for students.

Safety

The facilities must meet all Occupational Safety and Health Administration (OSHA) safety standards, where applicable.

Facility Evaluation

The program advisory committee should be asked to conduct an annual evaluation of the facilities to insure the program's continuing capability to meet instructional objectives.

Safety, Maintenance and Liability

SAFETY

S.B.E. Rule 6A-2.097

The Florida State Board of Education establishes rules for the operation of public schools. **Part III, Section B, Chapter 6A-2** of the State Board of Education Rules contains the standards for existing educational facilities. Subsections deal with the entire school facility in regard to such topics as electrical equipment, flammable materials, ventilation, fire safety, storage and illumination. Subsection 6A-2.097 contains safety regulations pertaining to vocational classes.

The statute requires 100 percent protection of every student and teacher participating in laboratory work wherein the type of activities listed in the statute above are conducted. This will include: demonstration by teachers or students, students and teachers present in a room or laboratory when students are engaged in make-up work or project work, and when anyone is using tools for construction or repair work involving the shaping or cutting of any solid materials.

Rules and regulations for an eye protection program should be organized and distributed to teachers, students and school personnel. Safety devices should be worn by those participating in the activity and by those who are observers or who may be in close proximity.

Marking of Hazardous Areas

Floors, walls, posts, stationary objects, machinery and equipment should be properly painted, marked, coded or identified, according to recommended safety practices of OSHA, the school board and industry.

Emergency Procedure For Injuries

The following procedures are recommended in the event of an injury or sudden illness in a student:

- Refer to the red "fire or medical emergency" signs posted in appropriate areas.
- Provide immediate first aid if so qualified.
- Notify appropriate personnel to advise them of the problem. They can also contact emergency trained personnel on campus.
- A conscious person has the right to refuse treatment and/or transportation to a medical facility.
- Advise students that they will be financially responsible for ambulance and emergency care.
- The paramedics will assume patient care upon arrival.
- If emergency transportation is not indicated, the student may spend time at the clinic, be allowed to go home or go to a medical facility.
- Be sure to complete the appropriate student injury form for any and all accidents or sudden illness.

MAINTENANCE

Schools should have the necessary facilities for routine maintenance. Special maintenance requirements for this program concern the hand and power tools and machines. Arrangements must be made to accomplish routine and non-routine maintenance of hand and power tools and cutting and shaping machines. Arrangements can be made through the school's shop or an outside agency.

VOCATIONAL TEACHER LIABILITY

Liability of Teacher and School Board

Negligence of vocational education teachers can cause unnecessary injury, and may result in teacher and school district liability. Vocational teachers are recommended to carry personal liability insurance. To reduce the risk of liability and injuries, the following suggestions are provided.

- Follow accepted policies of the school board.
- Do not allow students to use equipment or tools which have not been approved by the administration and Board of Education.
- Establish safety rules and enforce them.
- Do not leave the shop/laboratory while students are working.
- Do not permit non-enrolled students to use the shop/laboratory.
- Do not allow students to use machines or tools for which instruction has not been given.
- Do not approve unsupervised student activities inside or outside the shop/laboratory.
- Prepare accident forms for all accidents.
- Regularly inspect the workplace and equipment for defects or potential hazards and maintain documentation of unserviceable or hazardous items.
- Consider age, maturity, skill and ability of students when providing instruction and supervision.
- Administer safety tests to students upon completion of the demonstration of a specific machine, tool or process and keep documentation on file in your office.
- Require all students to wear eye protection devices, when appropriate, for laboratory activities.

SUGGESTED EQUIPMENT LIST

General Classroom Equipment

DESCRIPTION

Chalkboard

Bulletin board

Bookcases

Cabinet-storage

Student study stations

Audio-visual equipment as needed

Laboratory Tools and Equipment

These tools and items of equipment are normally used in this program. Equipment items are listed under each outcome, corresponding to the curriculum framework. Consumable supplies should be readily available to assure continuous instruction. Consumable supplies such as solder and wire are not contained in the equipment list.

01.0	DEMONSTRATE PROFICIENCY IN EVALUATING THE EFFICIENCY AND PERFORMANCE OF INDIVIDUAL PRODUCTION LINE EQUIPMENT

DESCRIPTION

Bar code reader
Benches with mounting base plates
Compact disk with SCSII interface
Electromechanical devices: D.C. motors, stepping motors, A.C. motors, servos, relays, stepping switches, timing devices, prony brakes, tachometers
Hydraulic actuators
Hydraulic compressor

Hydraulic flow meters
Hydraulic motors
Hydraulic pressure gages
Hydraulic pressure regulators
Hydraulic valves
Mechanical systems: pullies, gears, shaft, bearings, drive belts & chains, housings
Meter, Ammeter
Meter, analog VOMS
Meter, wattmeter
Microcomputer with printer, artic card, monitor & mouse
Pneumatic actuators
Pneumatic air compressor
Pneumatic indicators
Pneumatic motors
Pneumatic pressure regulators
Pneumatic switches
Pneumatic valves
Safety glasses
Safety goggles
Scope
Sensing elements for light, heat, motion, pressure, strain
Sterilization cabinet
VCR and monitor, valve & actuator models
Video camera
Video to digital converter

02.0 DEMONSTRATE PROFICIENCY IN INTEGRATING PRODUCTION EQUIPMENT WITH WORKCELLS, PROGRAMMABLE LOGIC CONTROLLERS AND AREA CONTROLLERS

DESCRIPTION

Band saw
Computer controlled machine lathe, mill or other CNC machine
Conveyor system
Drill press
Hand tool kits, wrenches, tubing benders, cutting tools
Lathe mill
Machine tooling & measurement equipment
Plastic ejection or forming equipment
Programmable logic controllers
Robots with variety of end effectors and attachments, hydraulic, electrical
Tool grinder
Work benches with vices and proper working surface

03.0 DEMONSTRATE PROFICIENCY IN BAR CODING, AUTOMATIC TRACKING VISION SYSTEMS AND AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS FOR MATERIALS HANDLING

DESCRIPTION

Hydraulic fitting kit
Hydraulic hose construction & repair equipment
Hydraulic hose test facility - high pressure 3000 psi

04.0 DEMONSTRATE PROFICIENCY IN MANUFACTURING SOFTWARE APPLICATIONS USED FOR PRODUCTION PLANNING, QUALITY CONTROL AND SHOP FLOOR DATA COLLECTION

DESCRIPTION

Material handling and storage system

05.0 DEMONSTRATE PROFICIENCY IN PROGRAMMING AND CONTROLLING PRODUCTION MACHINES IN A FLEXIBLE AUTOMATION ENVIRONMENT

DESCRIPTION

CIM software

06.0 DEMONSTRATE PROFICIENCY IN BAR CODING, AUTOMATIC TRACKING VISION SYSTEMS AND AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS FOR MATERIALS HANDLING

DESCRIPTION

NONE

07.0 DEMONSTRATE PROFICIENCY IN MANUFACTURING SOFTWARE APPLICATIONS USED FOR PRODUCTION PLANNING, QUALITY CONTROL AND SHOP FLOOR DATA COLLECTION

DESCRIPTION

NONE

08.0 DEMONSTRATE PROFICIENCY IN PROGRAMMING AND CONTROLLING PRODUCTION MACHINES IN A FLEXIBLE AUTOMATION ENVIRONMENT

DESCRIPTION

NONE

09.0 DEMONSTRATE PROFICIENCY IN OPERATING AND MAINTAINING PRODUCTION TEST EQUIPMENT AND INSTRUMENTS

DESCRIPTION

NONE

10.0 DEMONSTRATE PROFICIENCY IN CIM SYSTEMS ANALYSIS

DESCRIPTION

NONE

11.0 DEMONSTRATE PROFICIENCY IN OPERATING AND MAINTAINING MANUFACTURING EQUIPMENT FOR AUTOMATED ASSEMBLY

DESCRIPTION

Diagnostic software
Modem and multiplexer, bridges, routers
Network server - microcomputer with network software

12.0 DEMONSTRATE PROFICIENCY IN BASIC USE OF COMPUTER ASSISTED DRAFTING AND DESIGN EQUIPMENT USED IN A MANUFACTURING ENVIRONMENT

DESCRIPTION

CAD software
CAM software
Digitizer
Plotter

PROFESSIONAL DEVELOPMENT

Teacher Technical Updating

Technical updating workshops are scheduled periodically throughout the State, usually in the summer months. Teachers should take advantage of the opportunity to attend the Computer Integrated Manufacturing program technical update workshops when they are held. All instructional staff are encouraged to participate in as many training opportunities as possible.

Teachers should seek opportunities with local companies to maintain currency with industry trends. During periods when school is not in session, teachers are encouraged to make arrangements to return to industry for suitable involvement in their area of expertise.

Membership in professional associations offers vocational educators an enormous range of opportunities for working together to strengthen the field and to develop personal competence and satisfaction in work. The associations have similar goals and activities. They seek excellence in program content by means of joint efforts among members, communications that keep members current, forums for the discussion of issues in the field, useful and stimulating publications and sound professional growth experiences at local, state, regional and national meetings and annual conventions. They are concerned with increasing public understanding and support of the field. Teachers are encouraged to maintain affiliation with professional organizations. A list of professional organizations follows this section of the guide.

Teacher Standards

As a prerequisite to certification, teachers must have the required years of experience in the appropriate technical field as defined in the certification standards. For the Computer Integrated Manufacturing program, the requirements are six years continuous experience in computer integrated manufacturing. The teacher is then judged qualified to teach upon meeting one of the following criteria: (1) regular or temporary Florida teacher's certificate with appropriate coverage, (2) Approval of local school board consistent with adopted school policy or (3) regular or temporary Florida teacher's certificate with other than appropriate coverage (has met all occupational experience requirements prescribed as a prerequisite to appropriate certification and has been approved by the school board to teach

out-of-field). Refer to the Curriculum Framework for this program to determine the appropriate occupational specialization coverage required for certification.

Instructional staff must have technical competency and meet all State and local requirements for certification. Instructors should hold current, nationally recognized certification in the subject areas taught, if awarded. Beginning teachers must be enrolled in the State Beginning Teacher Program.

A systematic method of obtaining "substitute" instructors, approved by the school board, should be used to assure instructional continuity. An orientation session for substitutes should be held on a regular basis. The substitute should be a competent instructor in the occupational area and specific competencies taught.

Professional Organizations and Support Services

EDUCATION ORGANIZATIONS

AMERICAN VOCATIONAL ASSOCIATION (AVA)
1410 King Street
Alexandria, VA 22314
800-826-9972

FLORIDA ASSOCIATION FOR TRADE AND INDUSTRIAL EDUCATION, INC. (FATIE)
Florida Department of Education
Industrial Education - Vocational Division
Knott Building
Tallahassee, FL 32399
904-488-0484

FLORIDA VOCATIONAL ASSOCIATION (FVA)
1420 North Paul Russell Road
Tallahassee, FL 32399
904-878-6860

FLORIDA VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)
Florida Department of Education
Knott Building
Tallahassee, FL 32399
904-488-0484

TRADE ORGANIZATIONS

This list contains trade associations and technical societies. Many offer training programs of some sort, either directly or through their member companies. Specific details should be requested in writing.

ALLIANCE FOR ADVANCED MANUFACTURING PRODUCTIVITY (AMP)
C/O Autodesk, Inc.
2320 Marinship Way
Sausalito, CA 94965
(415) 332-2344
FAX (415) 331-8093

NUMERICAL CONTROL SOCIETY
5411 East State Street
Rockford, IL 61108-2378

SOCIETY OF MANUFACTURING ENGINEERS
P.O. Box 930
Dearborn, MI 48121-0930

State of Florida
Department of Education
Tallahassee, Florida
Betty Castor, Commissioner
Affirmative action/equal opportunity employer

IE590 BK-91

CAREER MERIT ACHIEVEMENT PLAN (CAREER MAP)

COMPUTER INTEGRATED MANUFACTURING

(0615.049901)

STUDENT'S NAME

State of Florida

An affirmative action/equal opportunity employer

DEPARTMENT OF EDUCATION
Betty Castor, Commissioner of Education

DIVISION OF VOCATIONAL, ADULT AND COMMUNITY EDUCATION
Robert S. Howell, Director

DEVELOPED BY:
University of South Florida
Department of Adult and Vocational Education

INDUSTRY-BASED PARTNERSHIP PROGRAMS: The State of Florida is committed to the development of industry-based partnership programs, designed by education and industry to respond to industry's demand for a highly skilled work force.

ACKNOWLEDGEMENTS

PARTNERSHIP WITH INDUSTRY

The following industry representatives are recognized, in addition to original industry members, for their valuable contributions to the identification and validation of the Computer Integrated Manufacturing Technology competencies reflected in this MAP:

Robert Bradey, LESCO
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Jorge Del Toro, Monsanto Company
Samuel C. Hunt, Pratt and Whitney

For further information, contact
Bureau of Vocational Program and Staff Development
Division of Vocational, Adult, and Community Education
Department of Education
Knott Building
Tallahassee, FL 32399

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THIS MERIT ACHIEVEMENT PLAN RECORDS THE COMPUTER INTEGRATED MANUFACTURING ACHIEVEMENTS OF:

Student's Name _____

Student ID Number _____

Student's Address _____

_____

Initial Instructor _____

School _____

Date Started _____

PRIMARY JOB TITLE(S) FOR COMPUTER INTEGRATED MANUFACTURING

- Automation Equipment Technician

Program completers qualify for the primary job title(s) listed above. Related job titles may be added based on those job titles found in industry and/or the Dictionary of Occupational Titles.

OVERVIEW

This Career MAP includes the competencies required for entry into the field of computer integrated manufacturing. Business and industry representatives have recommended that students in this field master these competencies in order to become employable. Local education agencies (LEAs) may adapt these competencies to meet their workforce needs.

PURPOSE OF THE MAP

The purposes of the MAP are: to display the student performance standards (SPS) required by the LEA and to document the level of achievement on student performance standards that the student demonstrates.

HOW TO USE THE MAP

Administrator and Instructor. The administrator and instructor can use Career MAPs in curriculum planning, program updating and improvement and teacher recruitment, selection and updating. If the LEA changes or adds student performance standards, the revised or additional student performance standards should be included in the blank boxes that appear within each intended outcome or at the end of this MAP.

Instructor. The instructor can use Career MAPs to keep track of student progress on student performance standards. By periodically reviewing the ratings on student performance standards, the instructor can identify a student's strengths and weaknesses and, on that basis, identify the skills for which the student needs remedial instruction or advanced training. The MAP can also be useful in student counseling and evaluation.

Co-op Instructor/Employer. The employer who sponsors a co-op program should use the Career MAP for keeping a record of the student's performance on appropriate standards. The MAPs will also help the co-op instructor/employer in counseling and evaluating the student.

Student. The student may use the MAP to show potential employers the performance standards he or she has mastered. In order to present a complete record, the student should encourage the instructor/co-op employer to rate his or her level of achievement on all the appropriate student performance standards and to fill in the verification form/cooperative work experience page in the back of this MAP.

Employer. The MAP shows an employer the student performance standards mastered by the student (a prospective employee) and the proficiency level achieved on each student performance standard. This information can help the employer make decisions about hiring, job assignments and job-training needs.

RATING STUDENT PERFORMANCE STANDARDS

Performance Competencies. Ratings on student performance standards should be based upon business/industrial performance standards. The evaluator observes and evaluates student performance as he or she would in the role of the employer or supervisor.

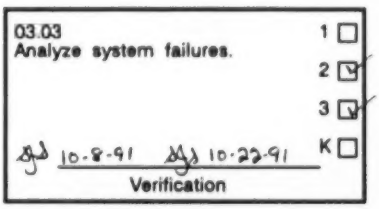
For each skill listed the learner receives a rating of 1, 2 or 3. Each rating indicates a particular level of achievement:

1 = Learner demonstrates knowledge and understanding of this student performance standard, but is not yet able to apply that knowledge or understanding.

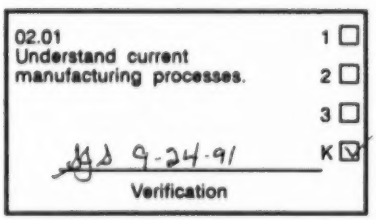
2 = Learner performs this student performance standard satisfactorily with only periodic supervision.

3 = Learner performs this student performance standard satisfactorily without supervision.

Whenever a performance standard is demonstrated, the instructor checks the appropriate rating box (1, 2 or 3) and initials and dates the verification line. If the student later demonstrates a higher level of achievement on a performance competency, the instructor checks the higher level and then enters his or her initials and the new date on the verification line, as shown in the following example:



Knowledge Competencies. For each SPS that is a knowledge competency only, with no manipulative skill involved, only one level of achievement is possible. If the student masters the competency, he or she receives a check in the bottom box ("K"), as shown below:



NOTE: A student performance standard without a checked rating indicates that the learner has not mastered the standard from lack of either ability, time, opportunity or need (the student's area of specialization may not have required it).

01.0 DEMONSTRATE PROFICIENCY IN MACHINES AND MECHANISMS.

01.01 Identify, define & analyze various electromechanical systems, including pneumatic, hydraulic & electrical. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	01.02 Construct flow diagrams of electromechanical system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	01.03 Analyze & identify mechanical linkages (gears, pulleys, limit switches, etc.). 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
01.04 Analyze & identify electromechanical devices (motors, servos, relays, stepping switches, timing devices, etc.). 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	01.05 Analyze & identify sensing elements. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	01.06 Analyze & identify optical canning & encoding/decoding devices. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
01.07 Analyze & identify error sensing/feedback & control mechanisms. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

02.0 DEMONSTRATE PROFICIENCY IN MANUFACTURING PROCESSES.

02.01 Understand current manufacturing processes. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.02 Understand the use of current manufacturing machines, operating systems & mechanisms. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.03 Understand hydraulic, electrical & pneumatic devices used in production assembly & materials handling. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
02.04 Understand OSHA, state, & local safety requirements for the manufacturing & assembly operations with automated equipment. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.05 Understand manpower needs & skills needed in assembly operations. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.06 Understand integration requirements for charging conventional manufacturing to CIM. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

02.07 Understand the criteria for tool design, maintenance, procurement & handling. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.08 Understand gage design, usage & limitations. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.09 Understand the requirements & solutions for raw materials orientation & clamping. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
02.10 Analyze & recommend the usage of jigs & fixtures, including effectors & special grippers for robotics. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.11 Understand the concepts & considerations required for products manufactured from sheet metal. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.12 Understand the special equipment required for sheet metal fabrication & forming. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
02.13 Understand concepts of injection molding equipment. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.14 Understand the concepts involved in the process of designing & fabricating specialized tools for numerical controlled machine application. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	02.15 Understand the concepts & special considerations involved with operating computer numerical control equipment. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
02.16 Understand the functions of the industrial computer & microprocessor controls in modern manufacturing. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

03.0 DEMONSTRATE PROFICIENCY IN OPERATING AND MAINTAINING MANUFACTURING EQUIPMENT FOR AUTOMATED ASSEMBLY.

03.01 Interpret blueprints, schematics & technical manuals. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	03.02 Establish routine operations involving maintenance schedules. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	03.03 Analyze system failures. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
03.04 Perform minor repairs to CIM systems. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	03.05 Coordinate & specify maintenance service. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	03.06 Evaluate need for equipment replacement, overhaul & retooling. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

04.0 DEMONSTRATE PROFICIENCY IN EVALUATING THE EFFICIENCY AND PERFORMANCE OF INDIVIDUAL PRODUCTION LINE EQUIPMENT.

04.01 Design the routing, storage & procurement/distribution systems for raw & finished products. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	04.02 Analyze & utilize statistical data from process control systems. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	04.03 Describe the relationship of equipment utilization to the manufacturing economy. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
04.04 Prepare & evaluate justifications for specification deviations. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

05.0 DEMONSTRATE PROFICIENCY IN INTEGRATING PRODUCTION EQUIPMENT WITH WORKCELLS, PROGRAMMABLE LOGIC CONTROLLERS AND AREA CONTROLLERS.

05.01 Design analog & digital control systems along with applicable software to specific manufacturing requirements. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	05.02 Chart & analyze ladder logic diagrams for manufacturing processes. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	05.03 Develop & analyze flow charts from ladder diagrams & related process controls. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
05.04 Operate Programmable Logic Controllers with device drivers. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	05.05 Apply software to workcells & area controllers. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	05.06 Integrate control systems & equipment with production & production support mechanisms. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

06.0 DEMONSTRATE PROFICIENCY IN BAR CODING, AUTOMATIC TRACKING VISION SYSTEMS AND AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS FOR MATERIALS HANDLING.

06.01 Describe automatic inventory accounting & control system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	06.02 List the underlying principles & method of controlling work in progress. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	06.03 Analyze product flow cycle. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
06.04 Describe warehouse throughput systems. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	06.05 Implement automated tracking in the laboratory environment. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	06.06 Describe machine vision applications. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
06.07 Maintain machine vision & sensing system equipment. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

07.0 DEMONSTRATE PROFICIENCY IN MANUFACTURING SOFTWARE APPLICATIONS USED FOR PRODUCTION PLANNING, QUALITY CONTROL AND SHOP FLOOR DATA COLLECTION.

07.01 Apply proficiency in manufacturing software application packages. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	07.02 Analyze data collection systems for maintaining the progress of each order. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	07.03 Assign & maintain priorities of individual orders. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

08.0 DEMONSTRATE PROFICIENCY IN PROGRAMMING AND CONTROLLING PRODUCTION MACHINES IN A FLEXIBLE AUTOMATION ENVIRONMENT.

08.01 Define & analyze product manufacturing requirements & process. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.02 Identify the responsibilities of management in produced production. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.03 Integrate personnel, hardware & software for the timely completion of product manufacturing. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
08.04 Describe the relationship of quality assurance & manufacturing. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.05 Apply the basic principles underlying the relationship between systems design, production & manufacturing engineering. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.06 Apply manufacturing simulation packages used in layout & design of production operations. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
08.07 Apply manufacturing resources planning & just-in-time concepts in production planning operations. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.08 Apply engineering economy factors in equipment justification. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	08.09 Apply microprocessor controls to a modern manufacturing system. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

09.0 DEMONSTRATE PROFICIENCY IN OPERATING AND MAINTAINING PRODUCTION TEST EQUIPMENT AND INSTRUMENTS.

09.01 Specify, interconnect & operate instruments & test equipment. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	09.02 Analyze normal & abnormal instrument readings & their probable causes. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	09.03 Specify & operate Automatic Test Equipment (ATE) procedures, using required software & hardware. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

09.04 Troubleshoot control systems mechanisms & software. 1 2 3 K Verification	09.05 Repair faults in production equipment & specify external repairs or overhaul requirements. 1 2 3 K Verification	09.06 Align, calibrate & maintain related ATE interfaces & circuits. 1 2 3 K Verification
09.07 Prepare error probability charts & graphs. 1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

10.0 DEMONSTRATE PROFICIENCY IN CIM SYSTEMS ANALYSIS.

10.01 Describe the concepts of a generic CIM system. 1 2 3 K Verification	10.02 Analyze & identify problems with the operation of industrial computers, controllers & hardware. 1 2 3 K Verification	10.03 Utilize typical screens & files available to shop floor operations for troubleshooting & data collection. 1 2 3 K Verification
10.04 Operate industrial terminals, input/output communications interface devices, etc., found in the manufacturing environment. 1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification
1 2 3 K Verification	1 2 3 K Verification	1 2 3 K Verification

11.0 DEMONSTRATE PROFICIENCY IN INSTALLING AND MAINTAINING & UNDERSTANDING NETWORK AND DATA COMMUNICATIONS DEVICES.

11.01 Identify & apply communications protocols. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	11.02 Identify & apply networks & classifications. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	11.03 Identify & apply throughput, memory size/ capabilities & standards benchmark. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
11.04 Identify & apply computer options for sharing directories, files & servers. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	11.05 Select & apply sensors & feedback devices. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	11.06 Select & interconnect cabling, repeaters, modems & multiplexers. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

12.0 DEMONSTRATE PROFICIENCY IN BASIC USE OF COMPUTER ASSISTED DRAFTING & DESIGN EQUIPMENT USED IN A MANUFACTURING ENVIRONMENT.

12.01 Operate CAD systems & hardware. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	12.02 Apply CAD support software to manipulate interval files, attributes, database exchange files, & set-up. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	12.03 Apply CAD software to create, edit, & update drawings & files. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
12.04 Identify & define protocols & software used to download CAD to CAM. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	12.05 Describe the relationship & functions of CAD in the industrial production environment. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

13.0 DEMONSTRATE PROFICIENCY IN USE OF QUALITY ASSURANCE METHODS & STATISTICAL PROCESS CONTROL TECHNIQUES.

13.01 Describe the concept of quality assurance in increasing productivity & promoting zero defects. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	13.02 Apply data collection methods for productivity improvement & reporting. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	13.03 Analyze productivity data, identify problem areas & evaluate the cause & effect relationship. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
13.04 Develop & apply quality improvement strategies. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	13.05 Develop & apply QA methods & techniques for production & product handling in a CIM environment. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	13.06 Understand process capability & its applications. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
13.07 Use statistical quality control (SQC) tools & techniques to analyze data. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

COMPUTER INTEGRATED MANUFACTURING

0.0 DEMONSTRATE EMPLOYABILITY SKILLS.

0.01 Conduct a job search. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.02 Secure information about a job. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.03 Identify documents that may be required when applying for a job. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
0.04 Complete a job application form correctly. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.05 Demonstrate competence in job interview techniques. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other persons. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
0.07 Identify acceptable work habits. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.08 Demonstrate knowledge of how to make job changes appropriately. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	0.09 Demonstrate acceptable employee health habits. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification

00.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP.

00.01 Define entrepreneurship. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	00.02 Describe the importance of entrepreneurship to the American economy. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	00.03 List the advantages & disadvantages of business ownership. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
00.04 Identify the risks involved in ownership of a business. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	00.05 Identify the necessary personal characteristics of a successful entrepreneur. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification	00.06 Identify the business skills needed to operate a small business efficiently & effectively. 1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

P.O.W.E.R. SKILLS (PRINCIPLES OF WORK ENVIRONMENT READINESS)

000.0 COOPERATIVE WORK EXPERIENCE COMPETENCIES.

1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification
1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification	1 ☐ 2 ☐ 3 ☐ K ☐ Verification

VERIFICATION

The instructor should verify the level of mastery achieved by the student by initialing the competency box each time the student masters a competency. Later, if the student achieves a higher degree of mastery of a competency, the higher degree should be recorded and verified by the instructor.

INSTRUCTOR SHOULD SIGN FULL NAME AND SCHOOL NAME AND ADDRESS IN THE SPACE BELOW.

Verification	Signature
	Title
	School Name
	School Address

Verification	Signature
	Title
	School Name
	School Address

Verification	Signature
	Title
	School Name
	School Address

COOPERATIVE WORK EXPERIENCE

In addition to classroom training and laboratory performance identified on the Career MAP, this student has participated in cooperative work experience with employers as shown below:

Dates _____ Employer _____

Address of Employer _____

Supervisor _____

Supervisor Title _____

Dates _____ Employer _____

Address of Employer _____

Supervisor _____

Supervisor Title _____

Dates _____ Employer _____

Address of Employer _____

Supervisor _____

Supervisor Title _____

NOTES

This section of the MAP is provided so the instructor, employer, or student may list additional qualifying statements or other pertinent information. All comments should be initialed for verification.

State of Florida
Department of Education
Tallahassee, Florida
Betty Castor, Commissioner
Affirmative action/equal opportunity employer

IE589 BK-91